2.11 The Discriminant

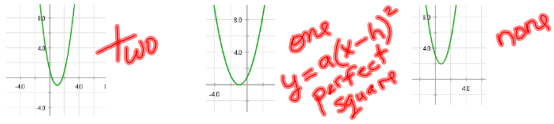
Solve each of the following equations using the Quadratic formula:

a) $2x^2 - 4x + 1 = 0$

b) $x^2 + 2x + 1 = 0$

c) $2x^2 - 3x + 3 = 0$

Picture it:



What do you notice about the number of roots?

We can determine the number of roots by looking under the radical sign

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This is know as the Discriminant $b^2 - 4ac$

If $b^2 - 4ac > 0$ then there is two real roots

If $b^2 - 4ac = 0$ then there is one real root

If $b^2 - 4ac < 0$ then there is no real roots

Ex 1: Determine the number of real solutions:

a) $2x^2 - x + 5 = 0$ $D = b^2 - 4ac$ $= (-1)^2 - 4(2)(5)$ $= -39$ no roots

b) $4(x+1)^2 - 7 = 0$ Vertex $(-1, -7)$ opens up two roots

c) $(x-6)^2 = 0$ $(x-6)(x-6) = 0$ one roots

d) $(x-3)(x+2) = 0$ $x = 3$ or $x = -2$ two roots

Ex 2:

For what values of k does $f(x) = x^2 + kx + 9$ have 2 distinct real solutions? (a b c)

$D = b^2 - 4ac$

$= b^2 - 4(1)(9)$

$= b^2 - 36$

$\sqrt{36} = \sqrt{b^2}$

$b = \pm 6$

ANS: $k > 6$ and $k < -6$

$= 6^2 - 4(1)(9)$

$= 36 - 36$

$= 0$

Ex 3: State the # of zeros

a) $5 = 4x^2 - 12x + 14$

$0 = 4x^2 - 12x + 14 - 5$

$0 = 4x^2 - 12x + 9$

a b c

one root

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(9)}}{2(4)}$

$= \frac{+12 \pm \sqrt{0}}{8}$

b) $3(x + 2)^2 = 7x$

$3(x+2)(x+2) - 7x = 0$

$3(x^2 + 4x + 4) - 7x = 0$

$3x^2 + 12x + 12 - 7x = 0$

$3x^2 + 5x + 12 = 0$

$= b^2 - 4ac$

$= (5)^2 - 4(3)(12)$

$= 25 - 144$

No solutions

Ex 3:

Given the quadratic equation:

$f(x) = -0.011x^2 + x + 1.6$

Can f(x) =15?

want a yes or no answer sub in 15 then look at the Discriminant

$15 = -0.011x^2 + x + 1.6$

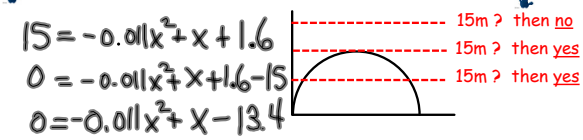
$0 = -0.011x^2 + x + 1.6 - 15$

$0 = -0.011x^2 + x - 13.4$

a b c

Picture it

Where is f(x)=15?



Assigned Work

p 232 # 2, 1d, 4 - 7, 14*, 15*